ANTHROPOPHILIC AND ZOOPHILIC PHLEBOTOMINE SAND FLIES (DIPTERA, PSYCHODIDAE) FROM THAILAND

C. APIWATHNASORN, S. SUCHARIT, K. SURATHIN AND T. DEESIN

Department of Medical Entomology, Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand

ABSTRACT. As a result of extensive surveys of sand flies carried out during 1987–90 in Thailand, species including a man-biter, *Phlebotomus hoepplii*, and cattle-biters, *P. argentipes* and *P. major major*, were discovered in Kanchanaburi Province. The human-baited catches revealed a low density of *P. hoepplii* and the biting occurred during 2100–2300 hours. *Phlebotomus hoepplii* was also found feeding on buffalo and inhabiting Pha-Thai Cave, Lampang Province. *Phlebotomus argentipes* was also a common cave-dweller and therefore had a wider distribution than *P. major major*, which was only collected in Sara Buri and Kanchanaburi provinces. The 3 species inhabited forest environments close to foothills and on stream banks. Although there is yet no evidence that they are involved in leishmaniasis transmission, the bionomics of the species are of importance and should be studied further.

INTRODUCTION

During the previous 3 decades, knowledge of sand flies of Thailand was very limited, as they were considered primarily zoophilic and of little importance in leishmaniasis transmission. Raynal and Gaschen (1934) appear to have been the first to describe Thai sand flies. In later years, the sporadic collection of sand flies by some workers resulted in a list of 9 species (Causey 1938, Theodor 1938, Quate 1962). The study of sand flies received a sudden impetus in 1987 following reports of imported cases of leishmaniasis among Thai laborers returning home from Middle Eastern countries (Charoenlarp 1986). Tangprasertsuk et al. (1987) conducted a serological and environmental survey of kala-azar in a village of Lampang Province where 124 people had experience working in Middle Eastern countries. They found that 4.76% of the people were serologically positive for *Leishmania donovani*. At the same time, sand fly surveys were conducted throughout the country to determine their distribution and potential as vectors. Fifteen species, including the cow-biter, *Phlebotomus major major* Annandale, were reported in the first survey in the northeastern part of Thailand (Apiwathnasorn et al. 1989). During 1989–90, the second survey conducted in the central and northern part of the country raised the number of species to 19, including both an anthropophilic and zoophilic species that have not been reported previously in Southeast Asia. This paper presents the distribution and brief ecological information of the anthropophilic and zoophilic species, which will be useful for investigating the risk of leishmaniasis transmission in Thailand.

MATERIALS AND METHODS

To collect as many species as possible, sand flies were captured from diurnal resting places by aspirators, from mammalian hosts by human- and cattle-baited traps, as well as by light traps and sticky traps according to their habits. The collections were carried out from dusk to dawn, except for the collection of daytime resting adults. All collected sand flies were preserved in 80% alcohol. They were cleared in a 30% solution of chloral hydrate in glacial acetic acid for 5 min and then mounted on slides in Hoyer's medium. Identification was based mainly on the keys and species descriptions provided by Lewis (1978, 1982). Some specimens were sent for deposit in the Natural History Museum (London).

RESULTS AND DISCUSSION

Most sand flies, in terms of quantity and number of species, were obtained from CDC light traps. Nevertheless, attempts to search for mammalophilic species were successful. An uncommon man-biter, *P. hoepplii* Tang and Maa, and cattle-biters, *P. argentipes* Annandale and Brunetti and *P. major major* Annandale, were found to be limited to some locations. The collection data are summarized in Table 1 and the details of the species are given below.

Anthropophilic species: P. hoepplii: The species was first found biting humans during 2100–2300 h at Nam Jon Dam site, a remote area in Kanchanaburi Province, in western Thailand. The sand flies were captured indoors in small numbers (3 per person per night). Apart from human-baited catches, less than 10 per night per trap of this species were also collected from buffalo-baited traps and light traps in Amphoe Sri Sawat, Kanchanaburi Province and Pha Thai Cave, Lampang Province (northern part). The collections revealed that they could live in forest, cave and peridomestic environments. Although the specimens were obtained from different parts of the country, the collection sites were all located close to large streams in the forest. In addition, as the sampling occurred in

Table 1. Collection data for *Phlebotomus hoepplii, P. argentipes* and *P. major major* in Thailand

Species	Collection			
	Date	Bait	No./night	Localities
P. hoepplii	Oct. 22, 1988	Human	3	Nam Jon Dam site, Kanchanaburi
	Mar. 10, 1989	Buffalo	9	Amphoe Sri Sawat, Kanchanaburi
	Jul. 8, 1989	Light trap	7	Pha Thai Cave, Lampang
P. argentipes	Sept. 8, 1988	Buffalo	10	Khun Krathing, Chumphon
	Mar. 10, 1988	Buffalo	10	Ban Tha Lamyai, Kanchanaburi (common in caves throughout Thailand)
P. major major	Mar. 18, 1986	Cow	20	Saraburi
	May 17, 1986	Cow	20	Pu Toei, Kanchanaburi

different seasons (Table 1), this species is possibly active throughout the year. The data were similar to Tang and Maa (1945) who found *P. hoepplii* to be active from April to October and attracted to human bait in houses.

Zoophilic species: Two species were found to feed on cattle, *P. argentipes* and *P. major major.* Although they were zoophilic, the feeding habits might change when the preferred hosts are absent or scarce.

Phlebotomus argentipes: This species is a well known vector of kala-azar in India. It is the most common cave-dweller and widely distributed in Thailand (Apiwathnasorn et al. 1989). *Phlebotomus argentipes* tended to be more peridomestic than forested species, as its common habitats were mostly located in temples in the rural areas. The localities where *P. argentipes* was found to feed on buffalo were Khun Krathing, Chumphon Province (southern part) and Ban Tha Lamyai, Kanchanaburi Province. Ten per night were captured on buffalo, in contrast to the hundreds easily collected by light traps in caves, where the species is believed to feed mainly on bats. Daytime resting places were caves and tree holes around the cattle sheds. It has been also reported by Lewis and Wharton (1963) in West Malaysia that *P. argentipes* fed on cows but had rarely been found biting man. Lewis (1978) summarized aspects of this species and reported variation that was partly associated with differences in feeding habits. In India and Sri Lanka, *P. argentipes* is anthropophilic; elsewhere it appears to be a woodland zoophilic and exophilic species.

Some structural characters of the specimens collected in caves differed from the species description given by Lewis (1978). The scutum is pale instead of dark brown and the spermathecae are obviously longer with more annulations (>30). This species is known to show some geographical variation (Lewis 1957). It was suggested by Bray in 1974 (Lewis 1978) that *P. argentipes* may be a species complex, including a zoophilic and an anthropophilic species, in one area.

Although it is abundant and widely distributed, particularly in caves throughout the country, the species is unlikely to create problems related to leishmaniasis transmission owing to its biting habits. Nevertheless, its bionomics should not be ignored.

Phlebotomus major major: The nominate form of *P. major* is a proven vector of visceral leishmaniasis in the Mediterranean area (Lewis 1974). Specimens were collected at dusk with cow-baited traps at Wat Tham Photisat, Sara Buri Province and also at Pu Toei, Kanchanaburi Province. Both collection sites were very humid and located at foothills. The species is also thought to occur along the Himalayan foothills between 1,555 and 2,135 m (Sinton 1932). Approximately 20 adults of both sexes were captured per night.

Although *P. major major* has similar biting habits to *P. argentipes*, it has a more limited distribution. No specimens of this species were found in caves, where *P. argentipes* was the most common. Further study is also needed to determine its bionomics and geographic distribution.

In conclusion, *P. hoepplii* and *P. major major* are reported for the first time in the Southeast Asian region as mammalophilic species of phlebotomine sand flies. Although the study revealed low densities of the species, it still needs to be determined whether establishment of imported

leishmaniasis in Thailand is possible or not. In addition, experiences in western China, despite low densities of vectors, show that transmission does still occur (Guan and Shen 1991). The ecological information obtained during these brief surveys is not adequate for predictions of epidemiologic value. Nevertheless, it is an initial step for in-depth studies of these known species to understand the extent of their geographic ranges, bionomics and vector potential.

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